

CLAIMS

What is claimed is:

1. A method of measuring the dishing of a first feature that is surrounded by a second
5 feature on a substrate, said method comprising:
generating a set of calibration data;
measuring the height variation of said first feature on said substrate;
and
correlating the height variation of said first feature with said
10 calibration data to determine the amount of dishing of said first feature.
2. The method of Claim 1, wherein said measuring the height variation of said first
feature is performed after a polishing process is used.
- 15 3. The method of Claim 1, wherein said first feature is a metal feature and said
second feature is a dielectric material.
4. The method of Claim 3, wherein said metal feature comprises at least one of
copper, aluminum, and tungsten
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5. The method of Claim 1, wherein generating a set of calibration data comprises:
providing a set of sample substrates having different values of first
feature widths;
processing said sample substrates to produce dishing of the first
25 features;
measuring the dishing of said first features on said sample substrates;
and
producing calibration data by relating the measured dishing to different
values of first feature widths.
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6. The method of Claim 5, wherein processing said sample substrates comprises
polishing said sample substrates.

7. The method of Claim 6, further comprising generating additional sets of calibration data for different polishing parameters.

5 8. The method of Claim 5, wherein measuring the dishing of said first features on said sample substrates comprises measuring the dishing using an atomic force microscope.

10 9. The method of Claim 5, wherein measuring the dishing of said first features on said sample substrates comprises measuring the dishing using a contact profilometer.

10. The method of Claim 1, wherein measuring the height variation of said first feature comprises utilizing at least one of a differential interferometer and a laser displacement sensor to measure the shape of the first feature.

15 11. The method of Claim 1, wherein said calibration data is provided in the form of calibration curves, and measuring the height variation of said first features further comprises interpreting said height variation as the shape of said first feature, said correlating the height variation of said first feature with said calibration data to determine the amount of dishing of said first feature, comprises:

20 correlating said shape of said first feature with said calibration curves to determine the amount of dishing of said first feature.

25 12. The method of Claim 11, further comprising associated an average radius of curvature with said shape of said first feature.

13. The method of Claim 11, further comprising associated an average radius of curvature to the amount of dishing from the calibration curves.

30 14. A method of producing a set of calibration data for comparing to the measured height variation of a first feature surrounded by a second feature on a substrate to determine the amount of dishing of said first feature, the method comprising:

providing at least one sample substrate having a plurality of first features surrounded by said second feature, said first features having differing widths and exhibiting dishing;

measuring the magnitude of dishing of said plurality of first features;

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relating said magnitude of dishing to at least one of the first feature widths and the profile shape of said first features.

15 15. The method of Claim 14, further comprising polishing said plurality of first features and surrounding second feature to produce dishing in said first features.

16. The method of Claim 15, further comprising relating said magnitude of dishing to the parameters used in said polishing.

15 17. A method of measuring dishing in a first feature, said method comprising:

providing a substrate having a first feature embedded in a second feature, said first feature and second feature having been polished to approximately planarize the top surface of said first feature and said second feature;

20 measuring the height variation of said first feature to determine the profile shape of said first feature;

comparing said height variation of said first feature with pre-generated calibration data that relates the magnitude of dishing to the profile shape of a first feature.

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18. The method of Claim 17, further comprising determining the width of said first feature, wherein said pre-generated calibration data further relates the magnitude of dishing to the first feature width.

30 19. The method of Claim 17, wherein measuring the height variation of said first feature comprises utilizing at least one of a differential interferometer and a laser displacement sensor to measure the shape of the first feature.